Compilation of Division of Planning Dredging Projects in the Delta (1990 - 1994)

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April 1995

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1990 NORTH DELTA PROGRAM DREDGE MATERIAL TESTING PROGRAM

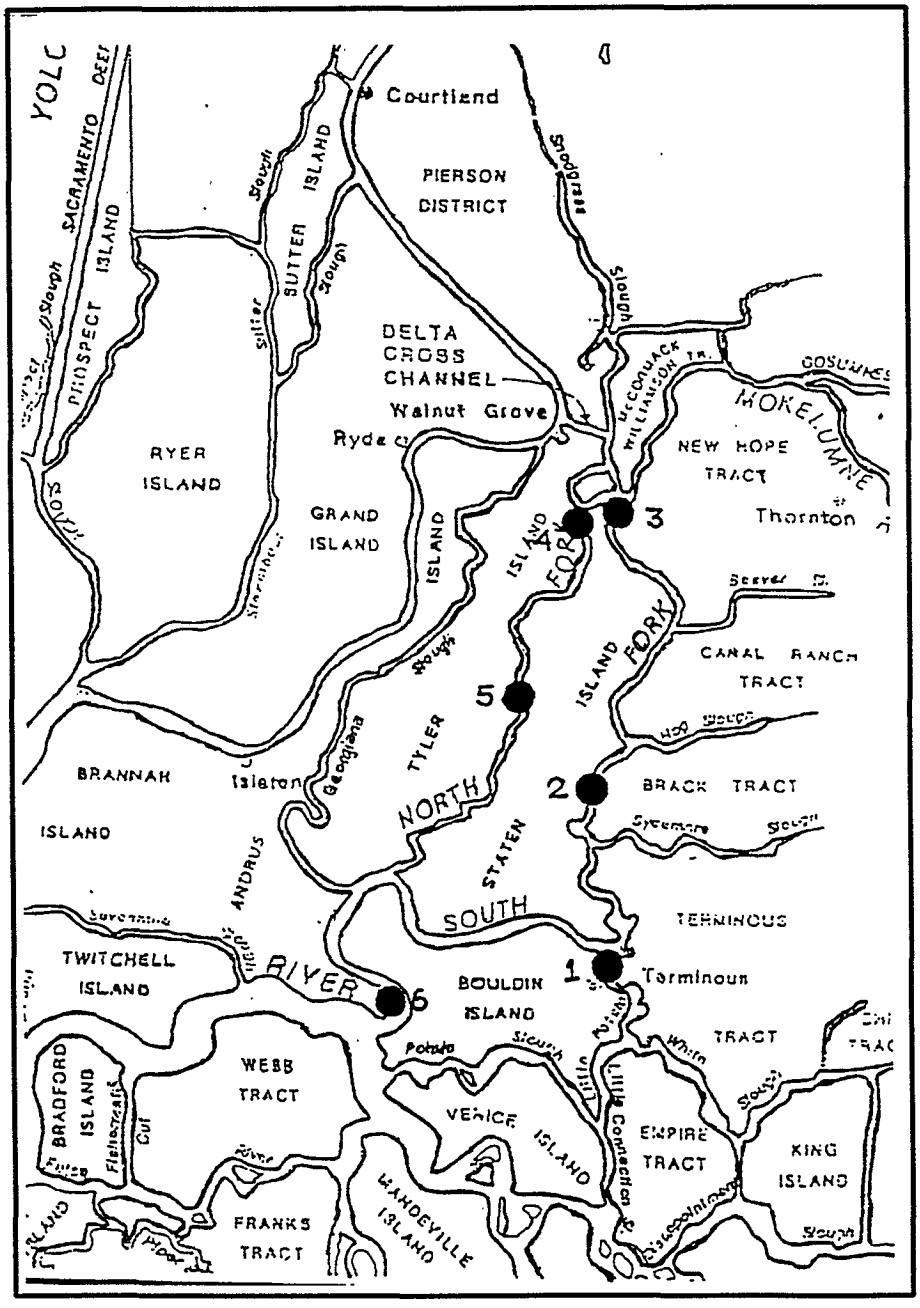
In the late 1989, the North Delta Program Dredge Material Testing Program was initiated to determine the composition of channel bed material from potential dredge sites in the North Delta. The samples collected were analyzed for several constituents of concern and the results were used to evaluate the potential for using dredge material for levee reinforcement. Six sites on the Mokelumne River system were selected on the basis of probable toxicity from low to high.

Sediment

The sediment analytical results indicate that the sediment is not contaminated with respect to organic compounds and most metals. Most of the sites had selenium values in excess of the RWQCB screening criterion, but all of the selenium concentrations were less than the TTLC. All of the metals that were reported, including selenium, had concentrations that were less than the respective TTLCs. Results of the Waste Extraction Test (WET) indicated that since none of the constituents analyzed exceeded the STLCs; the sediment is not considered a hazardous waste in the State of California. Although some of the samples had TBT and total butyltin concentrations that were slightly higher than some of the monitoring data, the butyltin concentrations measured in this project are in the general range of background concentrations measured by other regulatory agencies.

- "Interim North Delta Program, Water, Sediment and Soil Quality Report" DRAFT June 1994

1990 Staten Island Sampling Sites



1990 Sample Site Descriptions

Site No.	Site Description
1	Little Potato Slough and south end of Terminous Boat Dock
2	South Mokelumne at end of Woodbridge Road
3	South Mokelumne 0.2 miles south of Walnut Grove Bridge
4	North Mokelumne River at USGS Stream Mile 4.5
5	North Mokelumne River near Walnut Grove Bridge
6	Mokelumne River at Korth's Pirates Lair Marina

1992 NORTH DELTA PROGRAM ENVIRONMENTAL STUDY

In 1992, an Environmental Study was initiated by the North Delta Program to help determine the impact to be expected as a result of proposed dredging activities associated with the program. Sampling was done to document and better understand the existing baseline conditions in the project area with respect to chemical and physical properties of channel water, channel sediment, and soil on the landside of existing levees. Thirteen (13) sites were selected along the Mokelumne River for water and sediment analysis. Nineteen (19) land sites were selected throughout the project area in an attempt to document baseline conditions for future disposal of dredge material on the backside of levees, and for construction of setback levees.

Water

Results of the organic analyses indicated that pesticides and PCB concentrations were non-detect for all of the sites. Results of the trace metal analyses indicated that several of the trace metals were found in non-detectable concentrations and the RLs were less than the WQOs. None of the detectable trace metals were found in concentrations exceeding their respective WQOs or MCLs. In the mineral analyses, nitrate, sulfate, and total dissolved solids were all less than their respective MCLs except that nitrate was greater than the MCL (10 mg/L) at one site (54 mg/L). Results of the tributyltin (TBT) analyses revealed non-detectable results for all samples, with a reporting limit of 0.10 ug/L. Since no standard test method for TBT exists, the methodology is developed by each individual laboratory. Non-detectable values are considered in compliance with the CVRWQCB WQOs.

Sediment

Review of the sediment results revealed that most of the organic analyses had non-detectable results (three had detectable results) and all were below their respective RWQCB and TTLC criteria. Trace metal analyses showed detectable concentrations of metals at most sites however with the exception of zinc, all the metals and trace elements were below the RWQCB criterion. Zinc only exceeded the RWQCB criterion (160 mg/kg dry weight) at three sites. No sites exceeded either TTLC or STLC. Three sediment samples were selected for analysis using the WET and results showed that since none of the constituents analyzed were found in concentrations exceeding their respective TTLCs or STLCs, the sediment is not considered hazardous waste under Title 22 of the California Code of Regulations. All sediment samples were analyzed for TBT and results showed non-detectable levels at all sites. Acid generation potential N/A ratios for most sites was 3 or greater indicating low potential for the sediment to generate acid. However site 12/1 had a N/A ratio of 1.4 and site 3/2 had a N/A ratio of 2.4 indicating none of the metals at sites 12/1 and 3/2 had concentrations in excess of the potential for acid generation Therefore the probability of a significant release of metals at all sites is low.

Soil

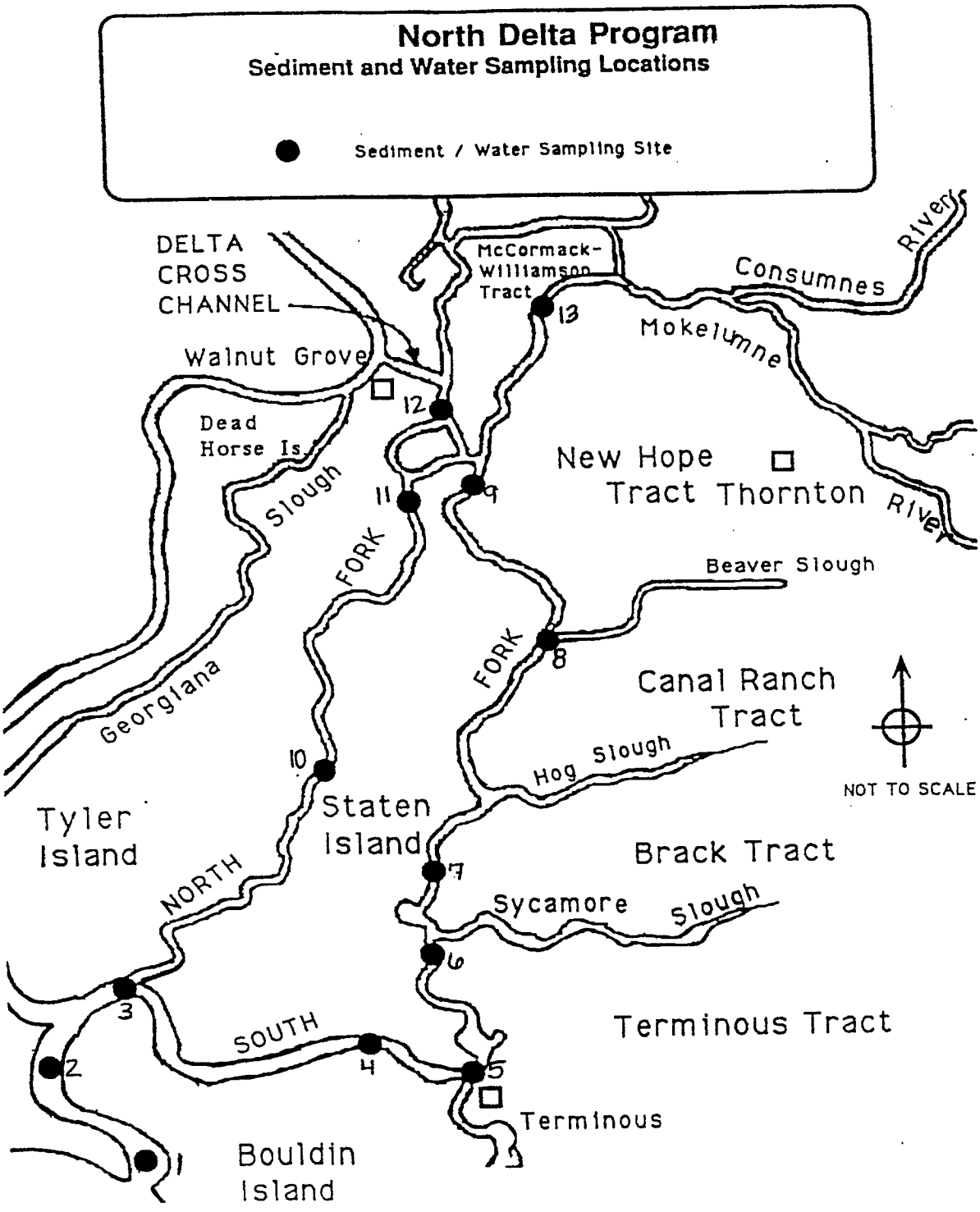
The soil samples also appeared to be unlikely to pose a threat to aquatic life. With the exception of DDT, no organics were found in concentration exceeding the EPA SQC or the RWQCB criteria. The RWQCB criteria for DDT (0.003 mg/kg dry weight) was exceeded in both the levee soil samples and the inland soil samples. However, it should be noted the RWQCB criteria apply to sediment, and neither the levee or inland soil samples are likely to become inundated. No organic constituents were found in concentrations exceeding the TTLC.

The majority of the metals and trace elements were found at concentrations below the RWQCB criteria.

Mercury was found to exceed the RWQCB criteria (0.35 mg/kg dry weight) at 5 sites: 4 levee soil sites and one inland site. Silver exceeded the RWQCB criteria (1.0 mg/kg dry weight) at 5 sites also: 3 levee soil sites and 2 inland soil sites. Lead slightly exceeded the RWQCB criteria (50 mg/kg dry weight) at one site, and inland soil site. As with DDT, it should be noted that none of these sample sites are likely to be inundated with water. Therefore, although the RWQCB criteria are exceeded, it does not imply that there will be an adverse impact to aquatic life. No TTLC criteria were exceeded at any of the soil sites.

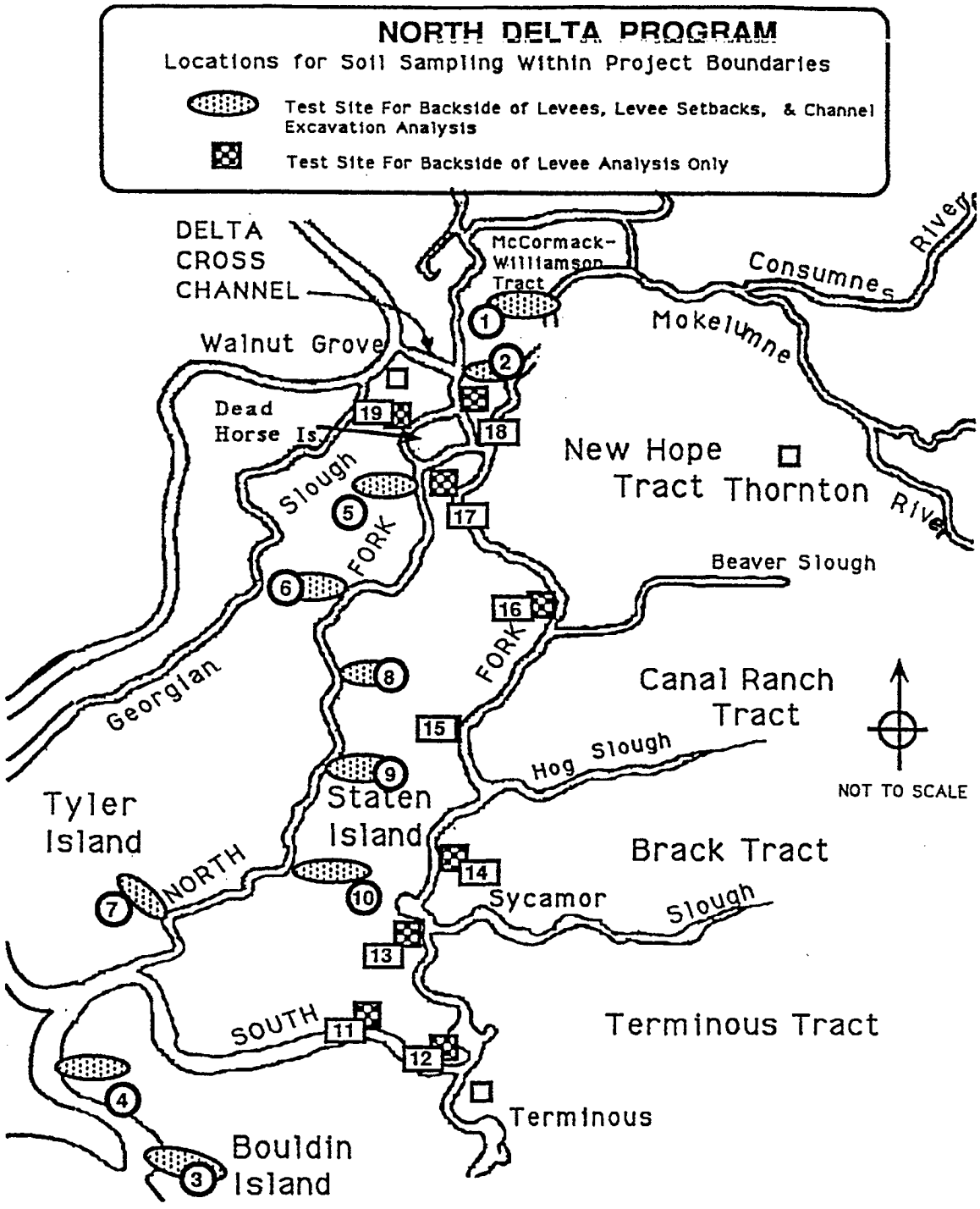
TBT concentrations ranged from non-detectable to 14 ug/kg dry weight. These values are well within the background sediment values.

"Interim North Delta Program, Water, Sediment and Soil Quality Report" DRAFT June 1994



Fall 1992 Sediment and Water Sample Site Descriptions

Site No.	Site Description
1	200 feet upstream of Pirates Lair Marina
2	1.1 road miles downstream, along Brannan Island Rd. from Hwy 12 overcrossing
3	200 feet downstream of mouth of South Fork Mokelumne River at south end of Staten Island
4	4000 feet downstream from junction of Little Connection Slough and South Fork Mokelumne River
5	At junction of Little Connection Slough and South Fork Mokelumne River
6	350 feet downstream of the confluence of Sycamore Slough and South Fork Mokelumne River
7	1 mile upstream from site #6
8	200 feet downstream of Beaver Slough
9	1000 feet downstream of Walnut Grove Rd. Bridge on South Fork Mokelumne River
10	4 miles upstream of mouth of North Fork Mokleumne River at south end of Staten Island
11	500 feet downstream from the southern tip of Dead Horse Island on North Fork Mokelumne River
12	100 feet downstream from junction of Dead Horse Cut and Snodgrass Slough
13	200 feet downstream of easterly end of Long East-West Farm Rd., on McCormack-Williamson Tract



Fall 1992 Inland, Drill and Levee Soil Sample Site Descriptions

Site No.	Site Description
1	4400 feet upstream from the confluence of North Mokelumne River and south Mokelumne River
2	3900 feet upstream from the confluence of North Mokelumne River and South Mokelumne River
3	2000 feet upstream on Mokelumne River from the confluence of Mokelumne River and San Joaquin River
4	1.8 miles upstream on Mokelumne River from confluence of Mokelumne River and San Joaquin River
5	900 feet downstream on North Mokelumne River from the confluence of Snodgrass Slough and North Mokelumne R.
6	2 miles downstream on North Mokelumne River from the confluence of Snodgrass Slough and North Mokelumne R.
7	1 mile upstream from head of North Mokelumne River where it splits from Mokelumne River
8	1.4 miles downstream from site #6
9	1.1 miles downstream from site #8
10	1.42 miles downstream from site #9
11	1.33 miles upstream on South Mokelumne River from the confluence of Little Potato Slough and South Mokelumne River
12	3000 feet upstream on South Mokelumne River from the confluence of Little Potato Slough and South Mokelumne River
13	750 feet upstream on South Mokeumne River from the confluence of Sycamore Slough and South Mokelumne River
14	4800 feet upstream from site #13
15	5000 feet upstream of South Mokelumne River from confluence of Hog Slough and South Mokelumne River
16	1500 feet upstream on South Mokelumne River from the confluence of Beaver Slough and South Mokelumne River
17	2.2 miles upstream from site #16
18	On the comer of Dead Horse Cut and Snodgrass Slough in McCormack-Williamson Tract
19	3200 feet upstream on Snodgrass Slough from confluence of North Mokelumne River and Snodgrass Slough

1992 ENVIRONMENTAL STUDY FOR THE INTERIM SOUTH DELTA PROGRAM

This environmental study was conducted to help determine the impact that could results from proposed dredging activities associated with the ISDP, including the effects of the physical and chemical components of the dredged material on the environment. In this study, the primary objective was to implement and establish methodology and a tiered investigation to determine the potential presence of toxics for a selected investigation area. Samples for the study included: channel water, dredged sediment, and levee soil.

17 sites were sampled for water and sediment analysis and 10 sites were sampled for soil analysis.

Water

A few of the metals and trace elements were found in detectable concentrations; however, all were below their respective water quality standards. Analysis of the pesticides and PCBs showed that they were non-detectable. One sample at site 5 (0.03 ug/L) was found to exceed the tributyltin WQO. All other sites had non-detectable concentrations of TBT, with a RL of 0.02 ug/L. No MCL exists for TBT.

Sediment

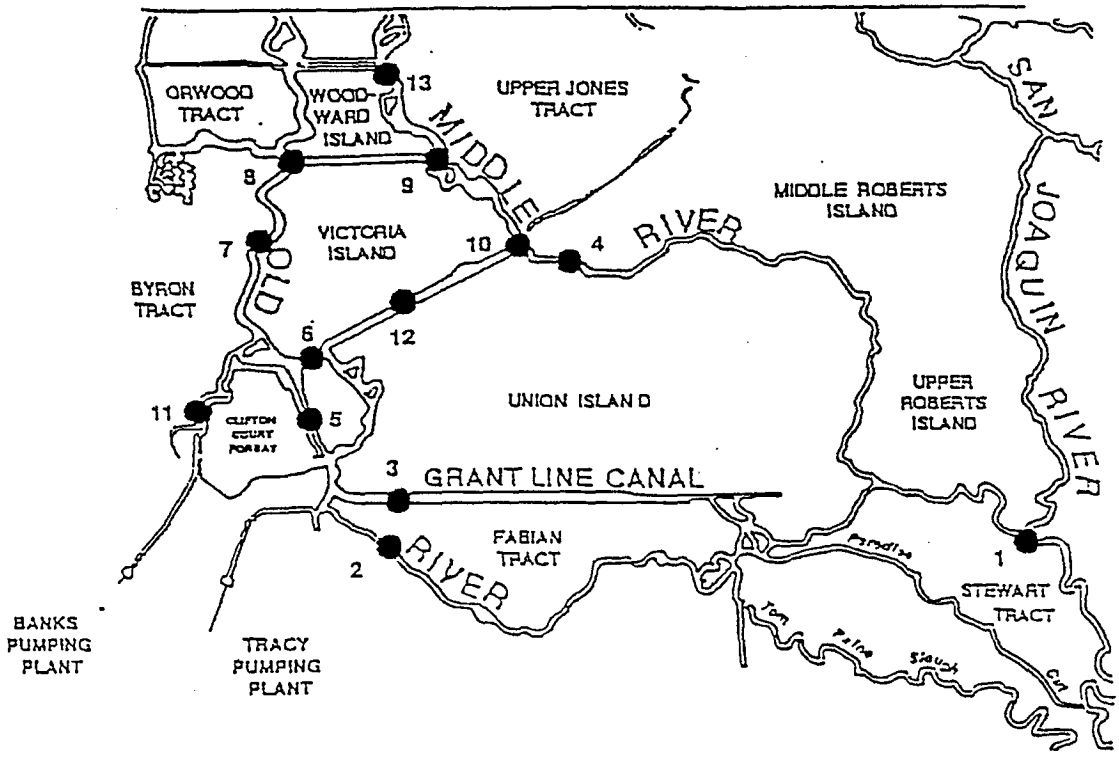
All of the organic analyses had non-detectable values or were present in very low concentrations which are unlikely to become available to pose a threat to aquatic life. Analysis of metals showed that there is not likely to be a concern with metal contamination. Silver was found at concentrations exceeding the RWQCB criteria at two sites, the remainder of the metals were below the RWQCB criteria at all sites. The TTLC was not exceeded at any sites. In terms of N/A ratios: site 1 had the lowest N/A ratio (zero), therefore, there is a significant potential for the sediment to become acidic; however, it is probable that any acidification of the sediment would results in minimal release of metals. Site 7 has a N/A ratio of 2.1 and Site 13 has a N/A ratio of 2.6. indicating a possibility of acidification of the sediment; however, for both of these sites, there is a low probability of metals release. The remainder of the sites had N/A ratios equal to or greater than three. Results of the WET performed on three sites (2, 4, 6B) indicated that only two metals (Copper and Zinc) were found at detectable levels. Since none of the constituents analyzed for was found to exceed the TTLC or STLC, the sediment is not considered a hazardous waste in the State of California. Sediment samples results indicated non-detectable levels of TBT for all sites with a RL of 2 ug/kg wet weight.

Soil

The majority of the organic analyses had non-detectable results, with the exceptions of DDD, DDE, and DDT; however none of the organic parameters had concentrations exceeding their respective TTLCs. Detectable concentrations of several metals were found at most of the sites however the concentrations were all below the TTLC criteria. The soil is not considered a hazardous waste in the State of California. TBT was found at nine sites ranging from 2 ug/kg dry weight to 21 ug/kg dry weight. However, the results for sites 8,9, and 10 are of questionable integrity due to laboratory quality control difficulties. However, comparison of soil sample results to the historical sediment data indicates the soil samples are at comparatively low concentrations.

- "Interim South Delta Program, Water, Sediment and Soil Quality Report" May 1994

1992 South Delta Program Water and Sediment Sampling Sites



SOUTH DELTA WATER MANAGEMENT SITE SAMPLING INFORMATION
(WATER QUALITY ANALYSIS)

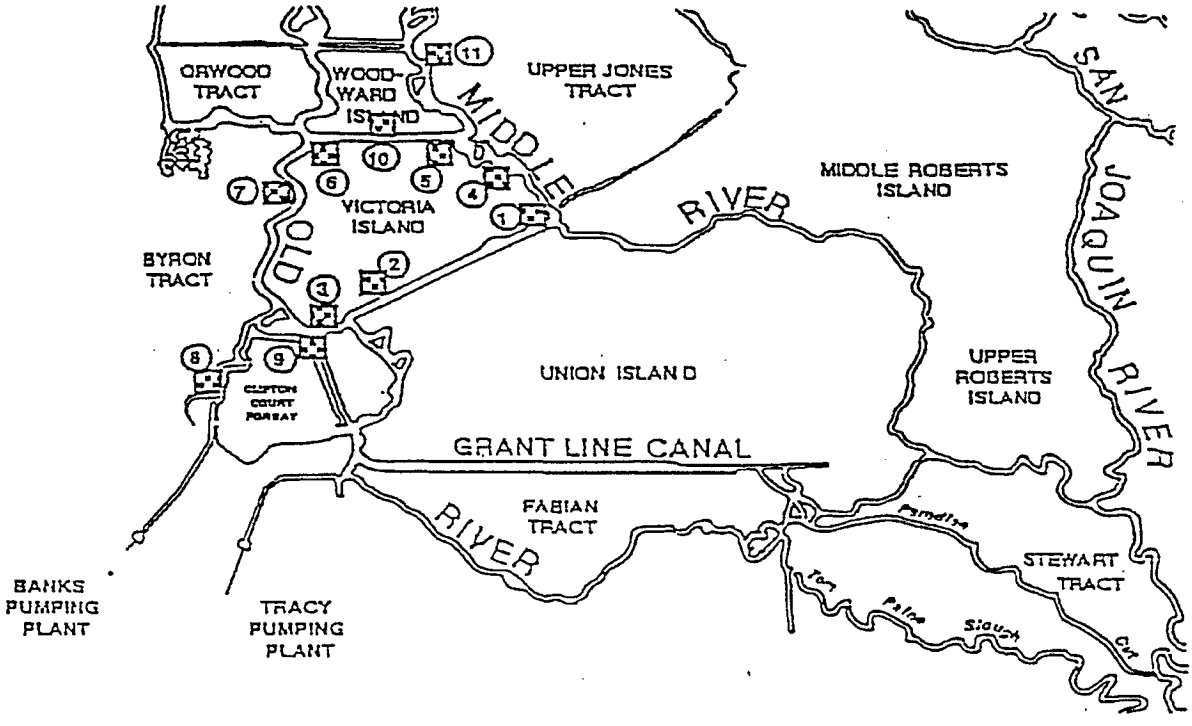
SITE NUMBER	DATE SAMPLED
1	10/20/92
2	10/20/92
3	10/20/92
4	10/20/92
5	10/20/92
6	10/20/92
7	10/21/92
8	10/21/92
9	10/21/92
10	10/21/92
11	10/21/92
12	10/21/92
13	10/21/92

D-031061

Sediment and Water Sampling Site Descriptions

Site Number	Site Description
1	On Old River just before the confluence of San Joaquin River and Old River; Northeast of Stewart Tract
2	About 3250 feet south on Old River from the confluence of the Delta Mendota Canal and Old River
3	About 3250 feet east on Grant Line Canal from the confluence of Old River and Grant Line Canal
4	West of barrier on Middle River; East of confluence of Victoria/North Canal and Middle River
5	About 4000 feet north on West Canal from confluence of West Canal and Old River
6A	About 1000 feet east on Old River from confluence of West Canal and Old River
6B	About 100 feet upstream from site 6A
7	Just north of the Hwy 4 bridge on Old River
8A	At the west end of the Woodward/North Victoria Canal on Old River
8B	About 150 feet downstream from site 8A
9A	At the east end of the Woodward/North Victoria Canal on Middle River
9B	About 25 feet from site 9A
10A	At the confluence of Middle River and Victoria/North Canal
10B	About 100 feet upstream from site 10A
11	About 2750 feet north on Italian Slough from Clifton Court Forebay
12	About 7250 feet east on the levee road from the confluence of Old River and Victoria/North Canal
13	At the Mokelumne Aqueduct on Middle River

1992 South Delta Program Soil Sampling Sites



SOUTH DELTA WATER MANAGEMENT SITE SAMPLING INFORMATION
(SOIL ANALYSIS)

SITE NUMBER	DATE SAMPLED
1	12/2/92
2	12/2/92
3	12/2/92
4	12/3/92
5	12/3/92
6	12/3/92
7	12/8/92
8	12/8/92
9	12/8/92
10	12/8/92
11	12/8/92

1992 Soil Sampling Site Descriptions

Site No.	Site Descriptions
1	On Victoria Island at confluence of Middle River and Victoria/North Canal.
2	On Victoria Island, from the southern most point proceeding along ht elevee road along vicotira/North Canal about 16250 feet.
3	On Victoria Island, from the southern most point proceeding along ht elevee road along vicotira/North Canal about 1250 feet.
4	On Victoria Island, north from Hwy 4 on levee road about 4275 feet.
5	On Victoria Island on North Eastern end at the confluence of North Victoria Canal and Middle River.
6	On Victoria Island on the northwestern end at the confluence of North Victoria.
7	On Byron Tract just north of Hwy 4 by Old River.
8	On Byron Tract at the southeast corner by Italian Slough.
9	On the land on the northeastern corner of Clifton Court Forebay.
10	On Woodward Island midway of Woodward/North Victoria Canal.

1994 ENVIRONMENTAL STUDY FOR THE INTERIM SOUTH DELTA PROGRAM

The primary objective of this environmental study was to help predict any potential environmental impacts that could occur as a result of the proposed dredging activities associated with the ISDP, including the effects of the physical and chemical components of the dredged material on the environment. The work completed in this study is a continuation of sampling which was conducted in 1992. Samples for the study included channel water and sediment from the proposed project alternative area. A future study is planned to evaluate the existing conditions on the sediment disposal sites.

Water

All of the samples had non-detectable results for pesticides, PCBs, and oil and grease. TBT was detected at a concentration of 0.002 ug/L in samples from sites 1 to 4 however no samples exceeded the WQO of 0.02 ug/L. A few of the metals and trace elements were found in detectable concentrations however all were below their respective water quality criteria.

Sediment

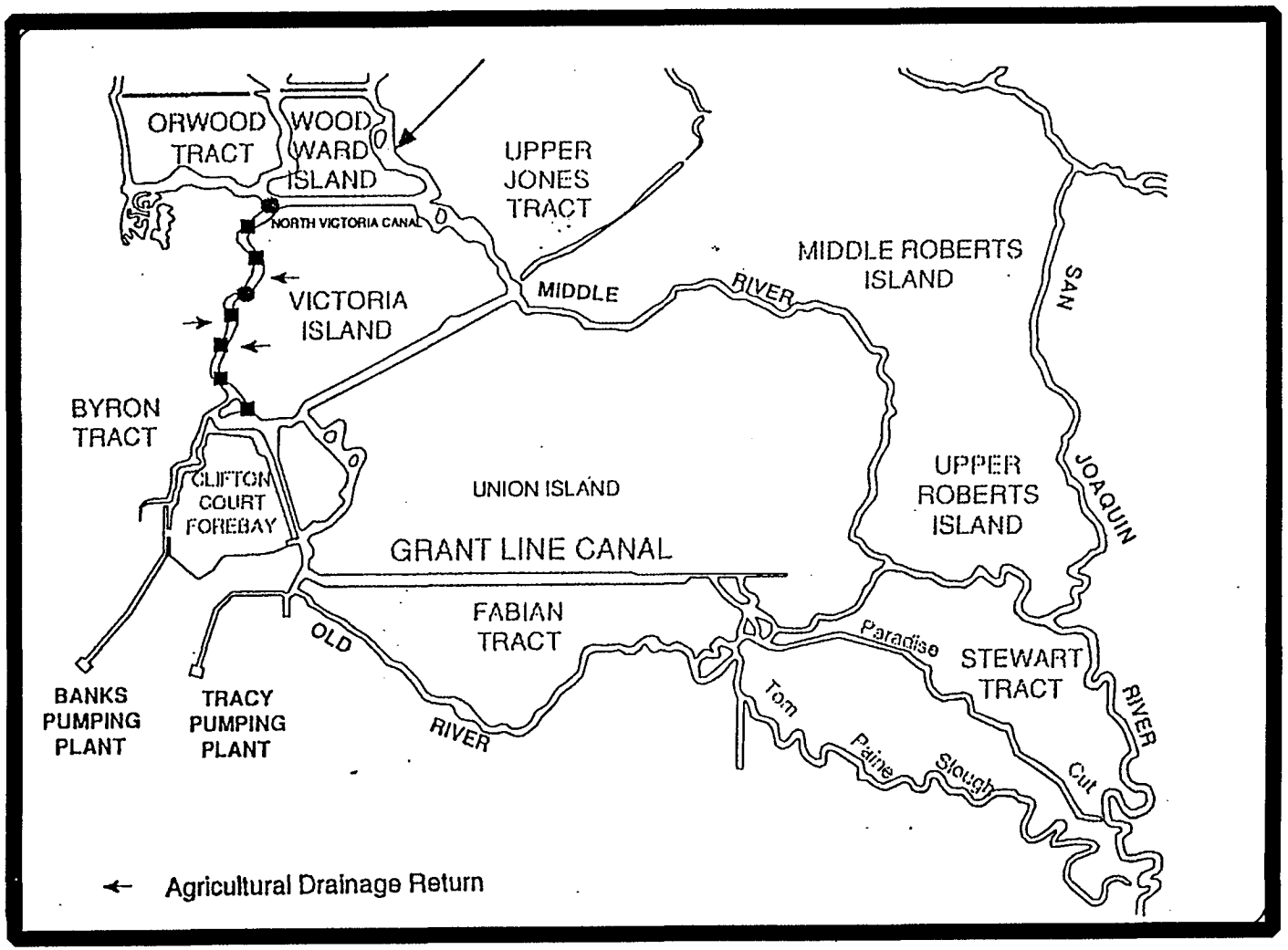
A grain size analysis was completed for all sediment samples and results indicate that samples from sites 1 through 5 were composed primarily of a combination of sand and silt; site 6 was classified with peat from 0-18 inches and clay from 18-30 and 42-54 inches. All sediment samples were analyzed for total organic carbon (TOC) and results ranged from non detect to the highest concentration of TOC at site 6 with 27,000 mg/kg at 18-30 inches. Concentrations of organochlorine pesticides, polychlorinated biphenyls, and polycyclic aromatic hydrocarbons were below the reported level of detection in all samples analyzed. In several cases the RLs were to high to determine compliance with the Ontario LEL, and in some cases the SEL. In all cases except DDT, the RL were well below the SFRWQCB sediment quality criteria. Most trace elements' concentrations were below their respective criteria; however, silver exceeded the SFRWQCB criteria at twelve of the eighteen samples and nickel exceeded the Ontario SEL at one site. The acid generation potential results indicated that in all cases the neutralizing potential is a least twice that of the acid forming potential. The WET was conducted using both deionized water and citric acid. None of the samples prepared using the deionized water had detectable metals results. Lead, mercury, nickel, and zinc were detected in samples prepared using citric acid; however the concentrations were very low.

Though comparison of the sediment concentrations with the Ontario guidelines revealed that several LEL and one SEL was exceeded however the values were almost always exceeded in the top sediment layers. Note that the Ontario's LEL and SEL guidelines are for the protection of the benthic organisms and therefore any removal of the sediment through dredging would actually expose cleaner sediment and improve the habitat for the benthos.

- "Water and Sediment Quality Study for the Interim South Delta Program" February 1995

1994 South Delta Program Sampling Sites

● Previously Tested ■ Proposed for Testing



1993 MORROW ISLAND DISTRIBUTION SYSTEM RECONNAISSANCE PROJECT

The primary objective of the reconnaissance is to help determine the impact to be expected as a result of proposed dredging activities associated with the Morrow Island Project, including the effects of the physical and chemical components of the dredged material on the environment.

Eight sediment samples were collected along two ditches. These samples were composited into four samples which were sent for analyses. The locations were selected based upon the volume of material to be dredged; consequently, more samples were taken in areas where more dredging is required. Sediment samples were taken using a stainless steel split core sampler and slide hammer.

Eight soil samples were collected from the south levee where the dredge material will be deposited. The soil samples were collected near the same point along the channel where the sediment samples were collected. The samples were composited into four samples. Soil samples were collected using a hand held auger.

Sediment

Review of the sediment results shows that with the exception of total petroleum hydrocarbons, all of the other organic analyses had non-detectable results. Total petroleum hydrocarbons were detected at all sites ranging from 190 to 1237 mg/kg dry weight. For TPH, no California or federal standards exist. Based upon this, it is recommended that further testing be conducted to evaluate the potential impacts of the TPH.

Analysis of the samples for metals indicated that in most cases there is not likely to be a concern with metal contamination. One exception is mercury which present in concentrations equalling or exceeding the RWQCB criteria at all sites. Another exception is zinc which was also found to exceed the RWQCB criteria, but at only one site. The remainder of the metals were below the RWQCB criteria. The TTLC was not exceeded at any sites.

With the exception of USACE values, the Morrow Island sediment samples appear to be well within these background concentrations for TBT.

The N/A ratio for the sediment samples was found to range from 0.30 to 1.5. No sites were found to have N/A ratio equal to 3 or greater. It is possible that acidification of the sediments may occur; however review of the constituent concentrations shows that the majority of the inorganics are present in concentrations below the RWQCB criteria. It is probable that any acidification would result in a minimal release of the metals, with the possible exception of zinc and mercury.

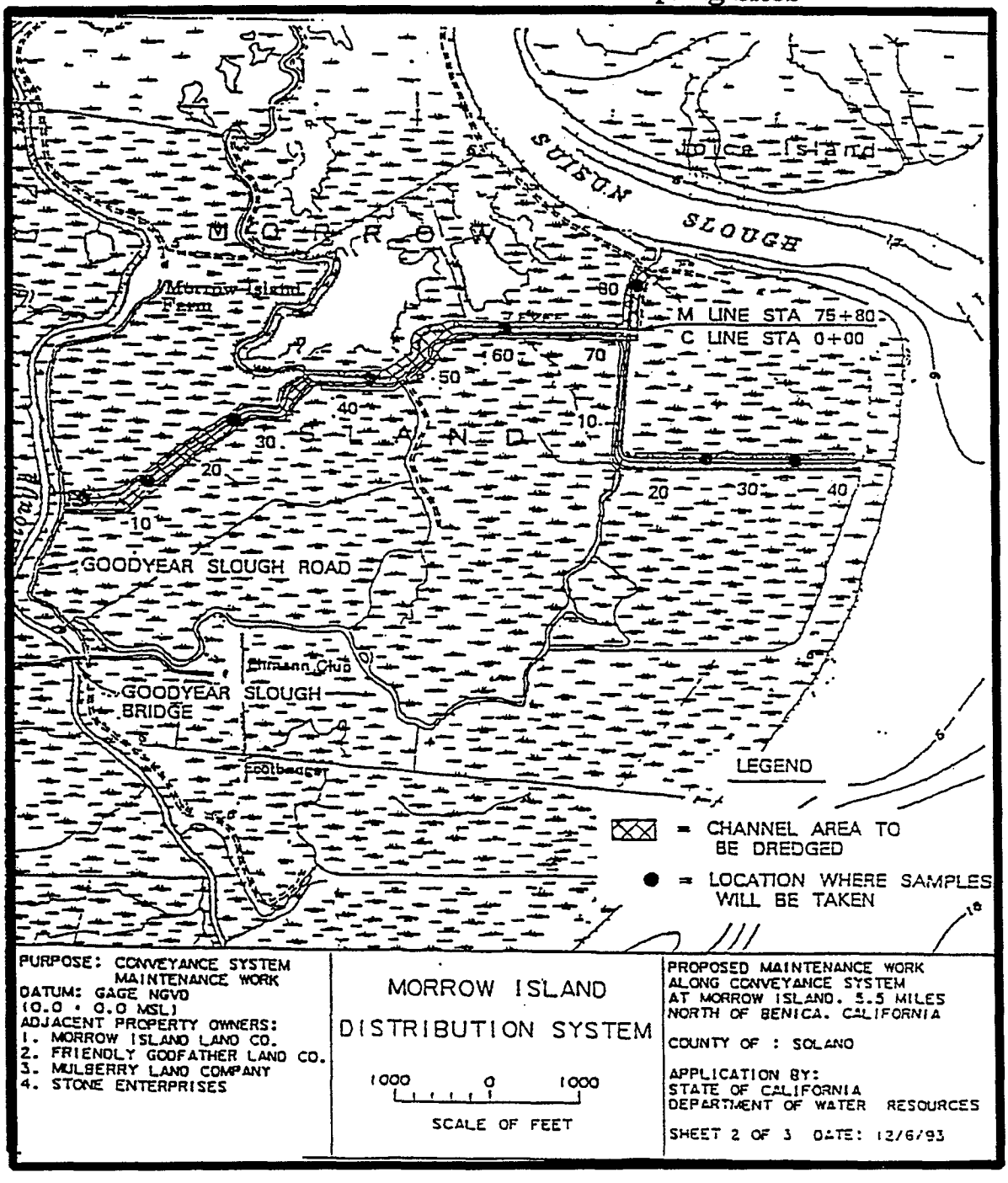
All samples were analyzed for electrical conductivity with concentrations ranging from 24.36 to 37.42 mmhos/cm. As with tributyltin, no criteria exists for EC however it can be evaluated by comparing with historical EC values. Comparing with values taken from the Suisun Marsh Monitoring Program Data Summary for three sites on Morrow Island from 1991 and 1992 water years indicates that the sediment samples are within the range of background values.

Soil

All of the organic analyses had non-detectable results. Since all the reporting limits were below the TTLC criteria, no organic constituents exceeded their respective TTLC criteria. As with the sediment, detectable concentrations of several metals were found at most sites however all of the concentrations were below the respective TTLC criteria. All soil sample sites were analyzed for TBT and resulted in non-detect. Comparison to historical sediment data indicates the soil samples are at comparatively low concentrations. The N/A ratio for the soil samples was found to range from zero to 6.38. Sites M1/2 and M3/4 had N/A ratios of 3.62 and 6.38 respectively. The high N/A ratio at these sites indicates that the soil may provide some neutralizing capacity to the dredge material that is added to the levee. The EC values for the soil samples ranged from 8.30 to 32.02 mmhos/cm. Comparison of these values to the historical data indicates that the soil samples have relatively low EC concentrations.

- "Morrow Island Distribution System Reconnaissance Project, Sediment and Soil Quality Report" DRAFT March 1994

1993 Morrow Island Sampling Sites



1991 STATEN ISLAND RECONNAISSANCE STUDY

In 1991, a Staten Island maintenance dredging operation was performed on the South Mokelumne River. During the dredging, the Department performed sediment sampling and analyses on six sites.

Sediment

Analysis of the sediment revealed mostly non-detectable concentrations of organics in the sediment. DDE and DDT sediment data were unusable because of poor data quality. DDD was detected but was found in concentrations that were less than the TTLC. In general, there were no significant quantities of organic compounds in the sediment. In all cases, the metals concentrations were less than the RWQCB sediment screening criteria and the TTLCs. Therefore, no significant metals contamination of the sediment was measured in this study. The butyltin concentrations measured in 1991 are within the background range of butyltin concentrations measured by the SWRCB and the U.S. Navy, and just slightly higher than the background range reported by the USACE.

"Interim North Delta Program, Water, Sediment and Soil Quality Report" DRAFT June 1994

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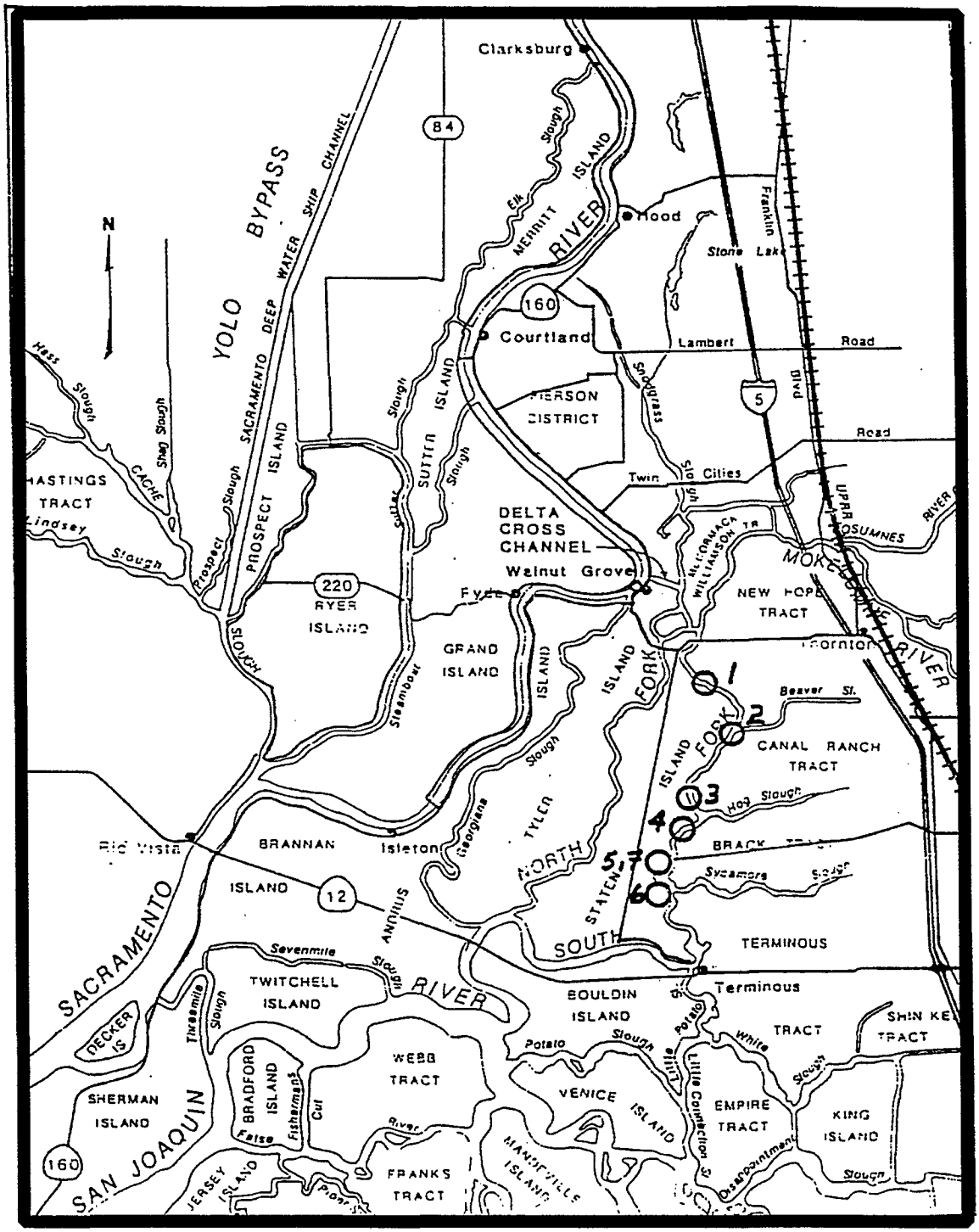
- "Interim North Delta Program, Water, Sediment and Soil Quality Report" DRAFT June 1994

1991 Staten Island Sampling Sites



1992 STATEN ISLAND RECONNAISSANCE STUDY

In 1992, the berm test project was conducted along the banks of Staten Island on South Mokelumne River, north of Beaver Slough. The southern boundary of the project area is directly across from the mouth of Beaver Slough and extends nearly 2500 lineal feet upstream. Nine (9) water samples and four (4) sediment samples were collected and analyzed and acute toxicity tests were done.

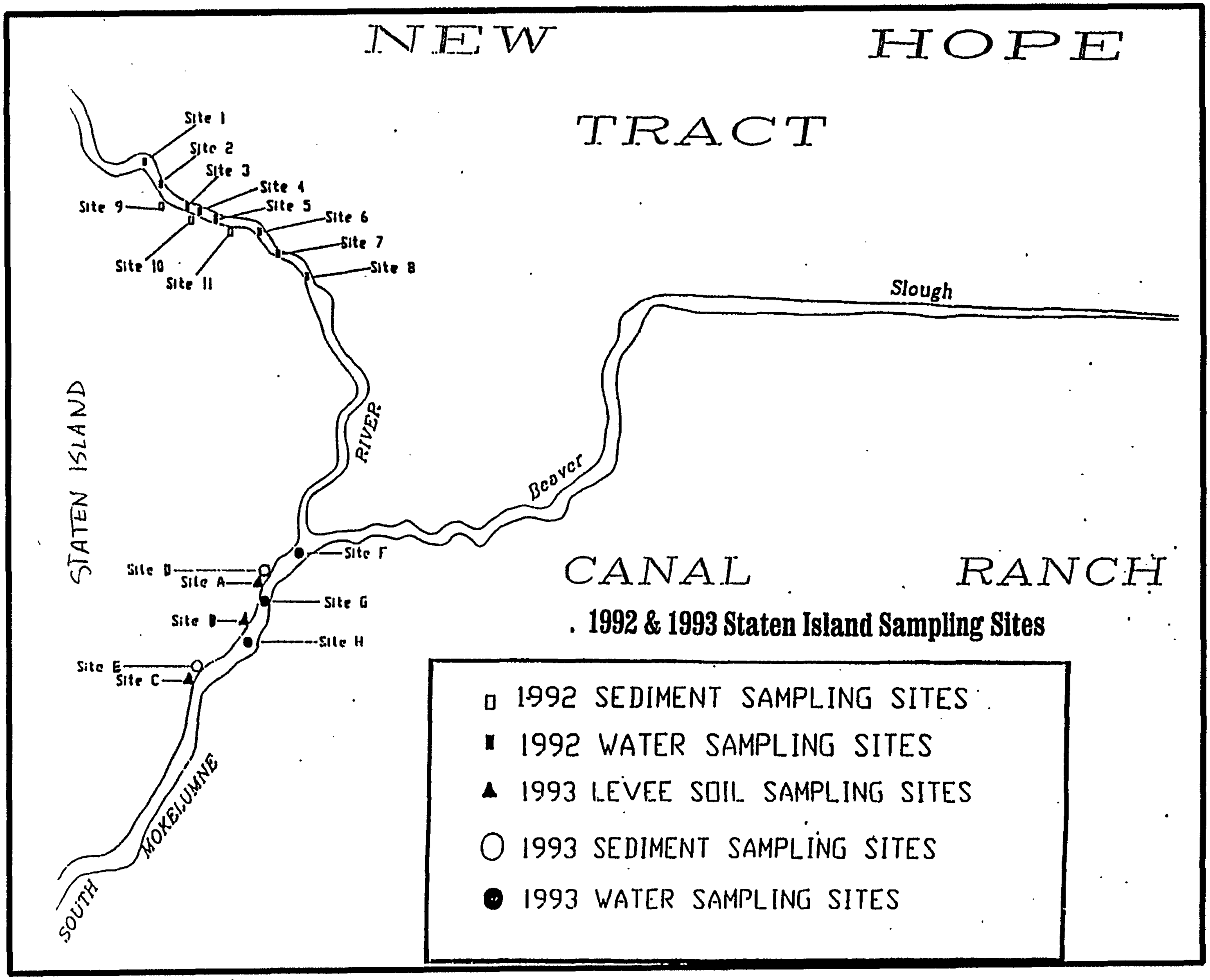
Water

The 1992 samples were not analyzed for organics. All metals measured were below the applicable WQOs and MCLs. Only two metals, arsenic and zinc, were detected above their reporting limits (RL), 0.001 mg/L and 0.005 mg/L, respectively. Bioassays were performed on water samples collected from a site within the dredge plume (site 4), using the 96-hour acute static renewal percent survival test with Threespine Stickleback (*Gasterosteus aculeatus*), and the chronic 96-hour static growth test with the green algae *Selenastrum capricornutum*. Results of the acute bioassays showed 95% survival. Results of the chronic bioassay found no change in algal growth between the control and the environmental sample.

Sediment

In the sediment samples, most trace metal concentrations were below their respective RLs. Arsenic, cadmium, chromium, copper, mercury, and nickel were detected at levels above the RLs but below the applicable criteria (SFRWQCB sediment criteria and TTLCs). Analysis of acid forming potential and acid neutralizing potential was performed on all sediment samples. The N/A quotients were all above 3.0 indicating low to extremely low acidification potential of the sediment. A WET performed with citrate buffer was conducted on the samples and it was found that none of the constituents which were analyzed exceeded the STLCs, the sediment is not considered a hazardous waste in the State of California. All of the sediment samples analyzed for tributyltin, have an estimated reporting limit of 1.3 ug/kg dry weight and only one sample (site 10) with 5.7 ug/kg dry weight, appears to be within the background concentrations for TBT measured by other agencies.

- "Environmental Study for the Staten Island SRAH Test Project Phase II, Water, Sediment and Soil Quality Report" August 1994 and "Interim North Delta Program, Water, Sediment and Soil Quality Report" DRAFT June 1994



1992 & 1993 Staten Island Sampling Sites

D—031074

D-031074

1992 Staten Island Sample Site Descriptions

Site No.	Site Description
1	2500 feet upstream from the confluence of South Fork Mokelumne River and Beaver Slough
2	2450 feet upstream from the confluence of South Fork Mokelumne River and Beaver Slough
3	2300 feet upstream from the confluence of South Fork Mokelumne River and Beaver Slough
4	2250 feet upstream from the confluence of South Fork Mokelumne River and Beaver Slough
5	2200 feet upstream from the confluence of South Fork Mokelumne River and Beaver Slough
6	1800 feet upstream from the confluence of South Fork Mokelumne River and Beaver Slough
7	1700 feet upstream from the confluence of South Fork Mokelumne River and Beaver Slough
8	1600 feet upstream from the confluence of South Fork Mokelumne River and Beaver Slough
9	2100 feet upstream from the confluence of South Fork Mokelumne River and Beaver Slough
10	2260 feet upstream from the confluence of South Fork Mokelumne River and Beaver Slough
11	2350 feet upstream from the confluence of South Fork Mokelumne River and Beaver Slough
12	2430 feet upstream from the confluence of South Fork Mokelumne River and Beaver Slough

1993 STATEN ISLAND RECONNAISSANCE STUDY

In 1993, because the project was smaller in scale (as compared to 1992), fewer samples were collected. Four (4) water samples, three (3) sediment samples, and three (3) levee soil samples were analyzed.

Water

All of the water samples contained organic compounds at concentrations below their respective RLs. For trace metals, several metals including aluminum, barium, iron and manganese were detected at concentrations above their RLs. All of the rest of the metals were not detected above their RLs. In most cases, the RLs were less than the WQOs, but a couple of exceptions were cadmium (RL is 0.005 mg/L which is greater than WQO of 0.00055 mg/L, but equal to MCL of 0.005 mg/L) and lead (RL is 0.005 mg/L which is greater than WQO of 0.00099 mg/L, but less than the MCL of 1.4-2.4 mg/L). Bioassays were performed on two samples collected, one upstream of the dredge plume and one within the plume. Results of the 96-hour acute static renewal percent survival test with Threespine Stickleback was 100%. The only criterion for TBT in water is the SWRCB WQO of 0.02 ug/L. The water had non-detectable concentrations of TBT with a RL of 1.0 ug/L.

Sediment

Evaluation of the sediment results shows that all of the organic analyses had non-detectable results. In most cases, the RLs were below any of the applicable sediment quality criteria. Two exceptions are the RLs for PCBs and DDT which are greater than the SFRWQCB sediment screening criteria but less than the TTLCs. For trace metals, most metal concentrations were below their respective RLs. However, Arsenic, chromium, copper, mercury and nickel were detected at levels above the RLs but below the applicable criteria (SFRWQCB sediment criteria and TTLCs). The acid generation potential N/A quotients were below 3.0 indicating potential to generate acid for site D, having a N/A quotient of 0.46, and site E, a quotient of 1.87. Because the metals are generally found in low concentrations, acidification of the sediment would result in minimal metals release. Results of the WET test with citrate buffer indicate that none of the constituents which were analyzed exceeded the STLCs. Therefore the sediment is not considered a hazardous waste in the State of California. Sites D and E were analyzed for TBT and were found to be non-detectable (with a RL of 1.3 ug/kg dry weight).

Soil

Organic analysis of levee soil samples showed that all of the concentrations measured were below their respective TTLCs. Trace metals analysis also showed that all of the concentrations of metals were far below their respective TTLCs. The acid generation potential N/A quotient for the three levee soil sites was below 3.0 indicating the potential to generate acid. However, since the metals are generally found in low concentrations, it is probable that any acidification of the sediment would result in minimal metals release. Soil samples analyzed for TBT were non-detect with a RL of 1.3 ug/kg dry weight. All metals analyzed under the WET test using citrate buffer were reported at concentrations below the associated STLCs. Therefore, the levee soil is not considered a hazardous waste in the State of California.

"Environmental Study for the Staten Island SRAH Test Project Phase II, Water, Sediment and Soil Quality Report" August 1994 and "Interim North Delta Program, Water, Sediment and Soil Quality Report" DRAFT June 1994

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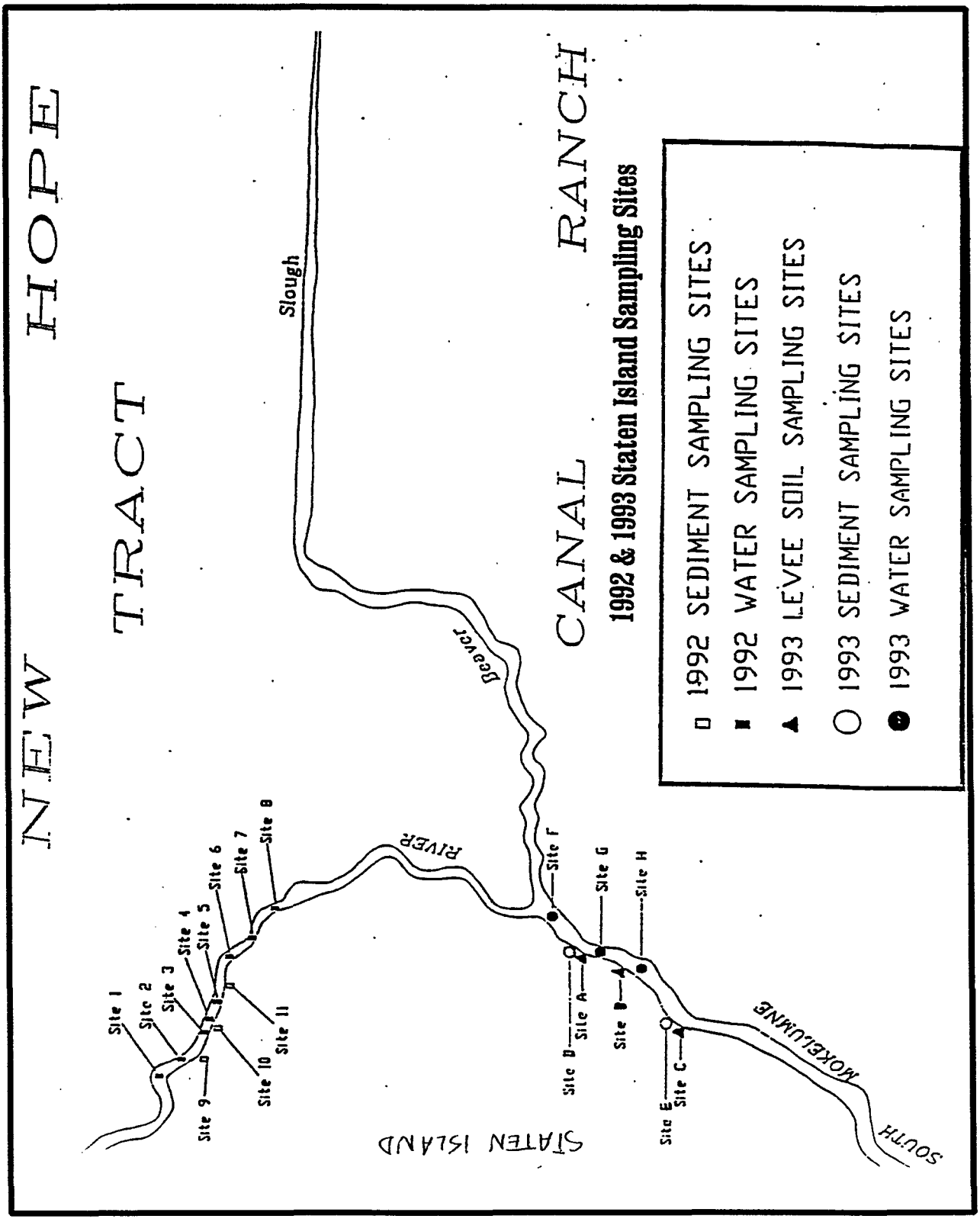

1993 Staten Island Sample Site Descriptions

Site No.	Site Description
A	1250 feet downstream from the confluence of South Fork Mokelumne River and Beaver Slough
B	1750 feet downstream from the confluence of South Fork Mokelumne River and Beaver Slough
C	3000 feet downstream from the confluence of South Fork Mokelumne River and Beaver Slough
D	1150 feet downstream from the confluence of South Fork Mokelumne River and Beaver Slough
E	2750 feet downstream from the confluence of South Fork Mokelumne River and Beaver Slough
F	250 feet downstream from the confluence of South Fork Mokelumne River and Beaver Slough
G	1400 feet downstream from the confluence of South Fork Mokelumne River and Beaver Slough
H	1900 feet downstream from the confluence of South Fork Mokelumne River and Beaver Slough

1994 STATEN ISLAND CHANNEL ISLAND RESTORATION PROJECT

In 1994, a project was conducted to fortify the foundations of four channel islands near Staten Island which have experienced sever erosion problems. Less than 22,000 cubic yards of fill material as placed behind rock prisms. The foundation of three of the four channel islands was fortified on their deep water sides. Rock backed by filter fabric was used to hold dredge material mounded high enough to support new vegetation.

Four (4) water samples were collected, four (4) composite sediment samples, and four (4) composite soil samples were collected for baseline information.

Pre-Project Sampling

Water

Results of the organic analyses indicated that pesticides and PCBs concentrations were non-detect for all of the sites. Results of the trace metal analyses indicated that several of the trace metals were found in non-detectable concentrations and these metals RLs were low enough to comply with WQOs. None of the detectable trace metals were found in concentrations exceeding their respective WQO or MCL. In the mineral analyses, nitrate, sulfate, and total dissolved solids were all at concentrations less than their respective MCLs. The water samples had non-detectable concentrations of TBT with RL of 1.0 ug/L.

Sediment

Results show that all of the organic analyses except one had non-detectable results. A sediment sample taken near channel island 2 had a DDE concentration of 0.002 mg/kg wet weight however this is far less than the TTLC of 1.0 mg/kg. In most of the samples, trace metal concentrations were detected at levels below the applicable criteria (SFRWQCB sediment criteria and TTLCs). However, in one sample, channel island 2, the copper concentration (91.5 mg/kg dry weight) was slightly above the SFRWQCB screening criterion (90 mg/kg dry weight). Five sediment samples had mercury concentrations (range 0.37 - 0.52 mg/kg dry weight) slightly above the SFRWQCB screening criterion (0.35 mg/kg dry weight). For both copper and mercury, most of the values were within experimental error of the SFRWQCB screening criterion. The acid generation potential N/A quotients for the sediment samples were in the range of 0.13 to 4.96 indicating the potential to generate acid. Since the metals are generally found in low concentrations, that acidification of the sediment would result in minimal metal release. The WET test performed with citrate buffer and deionized water on samples from all sediment sites were analyzed for standard metals. None of the constituents analyzed exceeded their respective STLCs. All of the sediment samples in this study had non-detectable concentrations of TBT.

Dredging Sampling

During the dredging sampling, two (2) water samples were collected for each channel island and four (4) composite sediment samples were collected from the dredge spoils on each of the four channel islands.

Water

The pesticide results were non-detectable and no toxicity was detected in the bioassay taken downstream of all the dredging sites. Results of the water analysis shows that all of the trace metals concentrations were less than

the respective WQO or primary MCLs.

Sediment

Results of the sediment analyses for pesticides showed that most of the pesticide concentrations were not detected or less than the applicable sediment criteria. Most of the sediment samples had metal concentrations that were less than the applicable criteria. A few samples had metal concentrations slightly greater than the SF Bay RWQCB criteria. Three (3) sediment samples had a mercury concentration of 0.5 mg/kg dry weight, slightly greater than SFRWQCB criterion of 0.35 mg/kg. Five (5) sediment samples had silver concentrations of 1.1 - 2.4 mg/kg, greater than SFRWQCB criterion of 1.0 mg/kg dry weight. Most of the metal concentrations were less than the SEL (severe effects level) of the Ontario Sediment Quality Guidelines. The only samples to exceed a SEL were four (4) nickel samples that had concentrations of 80-88 mg/kg dry weight, slightly greater than the SEL of 75 mg/kg dry weight. Results from the WET test performed with both citrate and with deionized water showed all of the concentrations were less than the respective WQOs and primary MCLs. Results of the analyses for acid generation potential show that the composite samples from channel 3 had low acid generating potential. The discrete samples from channel islands 4 and 5 varied from extremely low acid generation potential (N/A 5.0-21.0)) to moderate acid generation potential (N/A 1.1-1.6) had the potential to become acidic. Results of butyltin analyses show all of the concentrations to be less than 3.4 mg/kg dry weight and most concentrations less than 1.6 mg/kg dry weight. No criteria are available for butyltins in sediment.

- "Environmental Study for the Staten Island SRAH Test Project Phase II, Water, Sediment and Soil Quality Report" August 1994 and "Interim North Delta Program, Water, Sediment and Soil Quality Report" DRAFT June 1994

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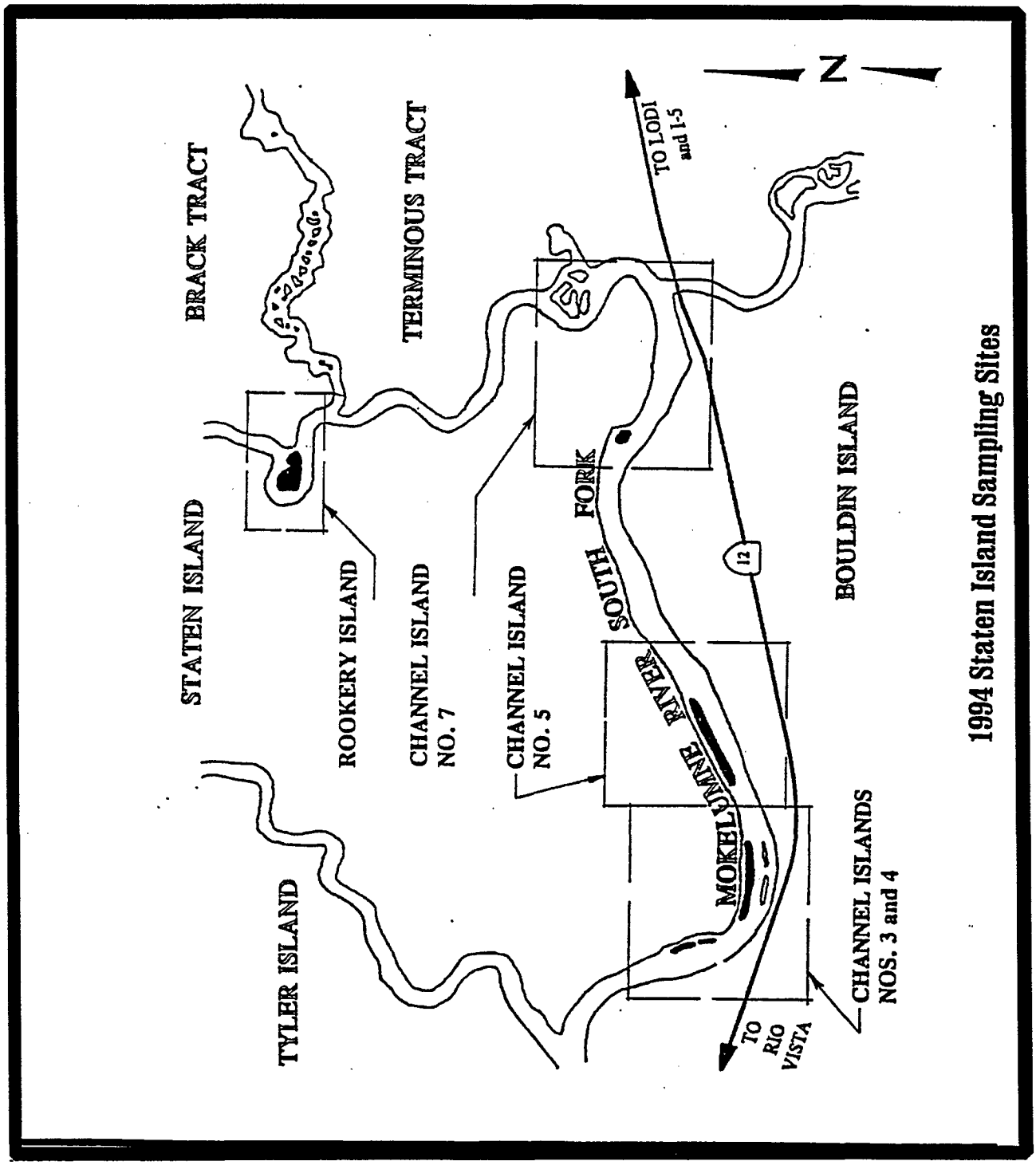


Monitoring Programs

1992 SHERMAN ISLAND PROJECT

The Department of Water Resources is involved in a pilot project on Sherman Island which involves the use of approximately 2500 cubic yards of dredge material from Suisun Slough as levee stabilization fill material.

The first project was carried out on Sherman Island beginning in late 1990 where 1,600 cubic yards of fine-grained material was placed as a levee stabilizing berm. The sediment was placed under permit from the CVRWQCB which required an extensive monitoring and reporting program (Monitoring and Reporting Program Number 90-735), including soil and water sampling and testing, and quarterly reporting of analytical results to the Regional Board. Monitoring continued into late 1992.

In a report written to the RWQCB on Sept. 1992, it was stated under the Conclusions and Recommendations section:

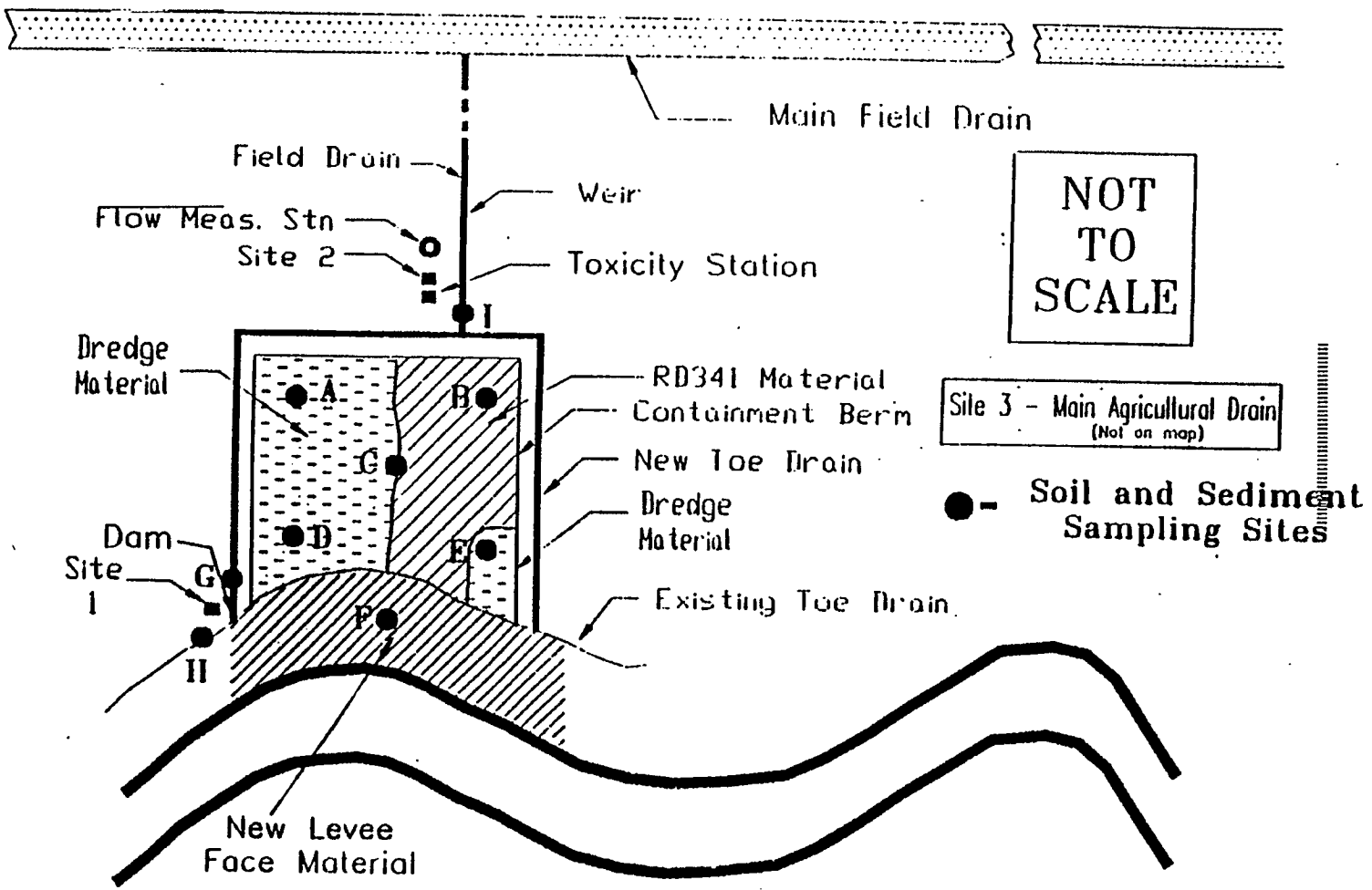
"Neither the soil samples nor the water samples have shown changes of high significance to date. pH values have remained relatively steady during the course of the project in both water and soil sediment samples. Measurements indicate a low risk of forming acid in the dredged materials. Analysis of water samples has shown that most of the minerals measured were at low levels, with concentrations of many being below reporting limits.

It does not appear that the relocated dredged materials have had or will have any major effect on the quality of the water flowing through the berm and levee. Based on our findings we conclude there is little threat of heavy metal contamination of soil and water in the surrounding area. Based on these conclusions we recommend the monitoring program be terminated."

The program was discontinued, with the Regional Board's approval, after the testing results (as seen above) indicated little to no impact from the imported sediment.

- "Sherman Island Pilot Project" Report Number 92-3, September 1992, Mike Sutliff, Rita Cheng

SHERMAN ISLAND PROJECT SITE



1992 Sherman Island Sampling Sites

D—031083

1992 TWITCHELL ISLAND PROJECT

This monitoring program concerns EC levels on Twitchell Island. Between August 4, 1992 and September 14, 1992, approximately 50,000 cubic yards of material from the Corps of Engineers' storage area on Simmons Island was offloaded on Twitchell Island and placed in a stockpile area at Oulton Point. As an aid to monitoring of runoff from the stockpiled material, two toe ditches were cut adjacent to the stockpiled material.

After the first significant water rain, EC readings were taken in November 1992 and at intervals since.

As finally constructed, approximately 400,000 cubic yards of material will have come from Clifton Court Forebay; 50,000 cubic yards from a commercial pit on the Sacramento River below Rio Vista; and, approximately 50,000 cubic yards from the Corps' Simmons Island storage area. Approximately 1000 cubic yards of the Simmons Island material remain in storage at Oulton Point, the rest having been used for berm construction from January 1993 to present.

Only limited indications have been found that dredged sediment imported from Simmons Island for levee rehabilitation has had an impact on water quality. Although a rise of EC in the easterly and westerly toe ditches may indicate a salt loading contribution from the Simmons Island material, an overall contribution above background EC in the stability berm subdrain and at the Reclamation District pumping plant cannot be identified. Since the monitored EC data are consistent with the annual cycle of salt leaching, and we expect no adverse impacts resulting from the placement of dredged material on Twitchell Island, it was proposed that the EC monitoring be discontinued on July 7, 1993.

- Letter "EC Monitoring Program on Twitchell Island" (with attachments) dated July 7, 1993 from Curt Schmutte, Special Flood Control Projects, DWR to Alexander MacDonald, CVRWQCB.

1992 Twitchell Island Sampling Sites
DEPARTMENT OF WATER RESOURCES
Dredge Material Reuse Projects
LEGEND
1a Suisun Bay Channel - Source of 40,000 cy of dredged sediment used to build levee ice berm at site 1c on Jersey Island.
1b New York Slough - Source of 25,000 cy of dredged sediment used to build levee ice berm at site 1d on Jersey Island.
2a Simmons Island - Source of 50,000 cy of dredged sediment transplanted to Twitchell Island, Site 2b and used in ice berm.
3a Suisun Slough - Source of 1600 cy of dredged sediment used as part of a 2500 cy ice berm at site 3b on Sherman Island.
Oulton Point - offloading and storage for material from 2a before reuse in levee ice berm.
Suisun Bay
Grizzly Bay
Montezuma Slough
Sacramento River
San Joaquin River
Rio Vista
Antioch
Benicia
Martinez
Twitchell Island
Sherman Island
Jersey Island
1a
1b
1c
1d
2a
2b
3a
3b

1994 STATEN ISLAND CHANNEL ISLAND RESTORATION PROJECT

A Monitoring and Reporting Program (MRP) was established by the CVRWQCB on August 8, 1994 which detailed the sampling requirements for during dredging sampling and post-project monitoring.

The first Quarterly Monitoring Report for the Staten Island Project came out in February of 1995. It had results from the water and sediment analyses for the Quarterly Monitoring sampling in November and December 1994.

Water

Results of the quarterly monitoring show that the leachate from the sediment deposited on the Channel Islands is not likely to be toxic. All water quality samples had constituent concentrations below water quality criteria including the water quality objectives and primary MCLs. Only one manganese sample had a concentration greater than a secondary MCL. None of the water samples exhibited biotoxicity.

Sediment

The sediment samples for the quarterly monitoring show metals concentrations that were lower than the TTLC hazardous waste criteria and in most cases less than the DFRWQCB seidment screening criteria. A few mercury and silver samples were slightly greater than the SFRWQCB. With the exception of a few nickel samples all sediment samples had concentrations less than the Ontario SEL guidelines.

The next quarterly sampling took place in March 1995. A quarterly report will be submitted to the CVRWQCB shortly.

- Memorandum "Staten Island Shaded Riverine Aquatic Habitat Quarterly Monitoring Report" (with attachments) dated February 27, 1995 from DWR to Mike Mosbacher, CVRWQCB

1994 JERSEY ISLAND DEMONSTRATION PROJECT

Sampling and monitoring of the Jersey Island Demonstration Project as outlined in the Waste Discharge Requirements and Monitoring and Reporting Program, Order No. 94-246 is being conducted. The following results are presented based upon the first monthly monitoring report issued in February of 1995. This analyzes four weeks of data.

Receiving Water Monitoring

The quality of receiving water is marginal when compared with drinking water standards established by both U.S. EPA and the California DHS. Also analyzed was the main drain (as seen in Figure #). Review of the data indicates that the drain water composition and quality is similar or only slightly of lower quality as compared to receiving water results. The concentrations of the mineral either remained the same or as for chlorine, went on a downward trend during the four week period. Trace Metals analyses results indicates that there are no detectable concentrations of dissolved metals which exceeds the limits given in the discharge prohibitions of the WDR. There were detectable concentrations of arsenic but they were below the limits.

Levee Background Soils Monitoring

The results of total metals analysis indicates that concentrations were below the SEL (severe effect levels) and the SFRWQCB's sediment criteria. A WET using deionized water showed that the leachate from the background levee soils does not contain detectable concentrations and so is unlikely to cause significant adverse effects on receiving and ground water.

Dredged Sediment Monitoring

The results of trace metals analyses for composite sediment samples indicate concentrations of total metals below SFRWQCB sediment criteria and Ontario's SEL. Results from the WET performed with deionized water indicate that concentrations of soluble metals in the leachate from the dredge sediments is far below the STLC criteria. The concentration of soluble lead (0.1 gm/L) in composite 16-18 exceeds the DHS MCL of 0.05 mg/L and the discharge concentrations established by the RWQCB. The concentration of silver (0.5 mg/L) in composite 4-6 exceeds the DHS MCL of 0.05 mg/L. No discharge limits for this metal were established by the RWQCB.

Sodium was the only general mineral parameter determined and its concentrations ranged from 1300 to 1600 ppm. Results of the deionized water WET indicates that the leachate from the dredge sediment soils is unlikely to cause significant adverse effects on receiving and ground water. All of the samples had no detectable results for pesticides, PCBs, TRPH, phthalate esters, oil and grease, and monobutyltins. TBT was detected its concentrations exceeds historical concentrations in the Delta, coastal waters, and naval ports of California but are lower than those encountered in waterways in Ontario, Canada.

Three Species Toxicity Monitoring

Results of the chronic toxicity monitoring showed that for the *Pimephales promelas*, the survival in the ambient or receiving water was acceptable and the Lowest Observed Effect Concentration (LOEC) and No Observed Effect Concentration (NOEC) for survival was greater than 100 for effluent or drain water; for *Ceriodaphnia dubia*,

the survival in the ambient water was acceptable and the LOEC for survival was greater than 100 in the effluent water; and for *Selenastrum capricornutum*, the growth rates were greater than 90% criteria and within the 20% variance permitted and LOEC and NOEC for survival was greater than 100%.

"Jersey Island Demonstration Project Monthly Monitoring Report" February 1995

1994 Jersey Island Sampling Sites

D—031090

1994 Jersey Island Sampling Sites